

C2110 *UNIX and programming*

Lesson 1 / Module 4

PS / 2020 Distance form of teaching: Rev2

Petr Kulhanek

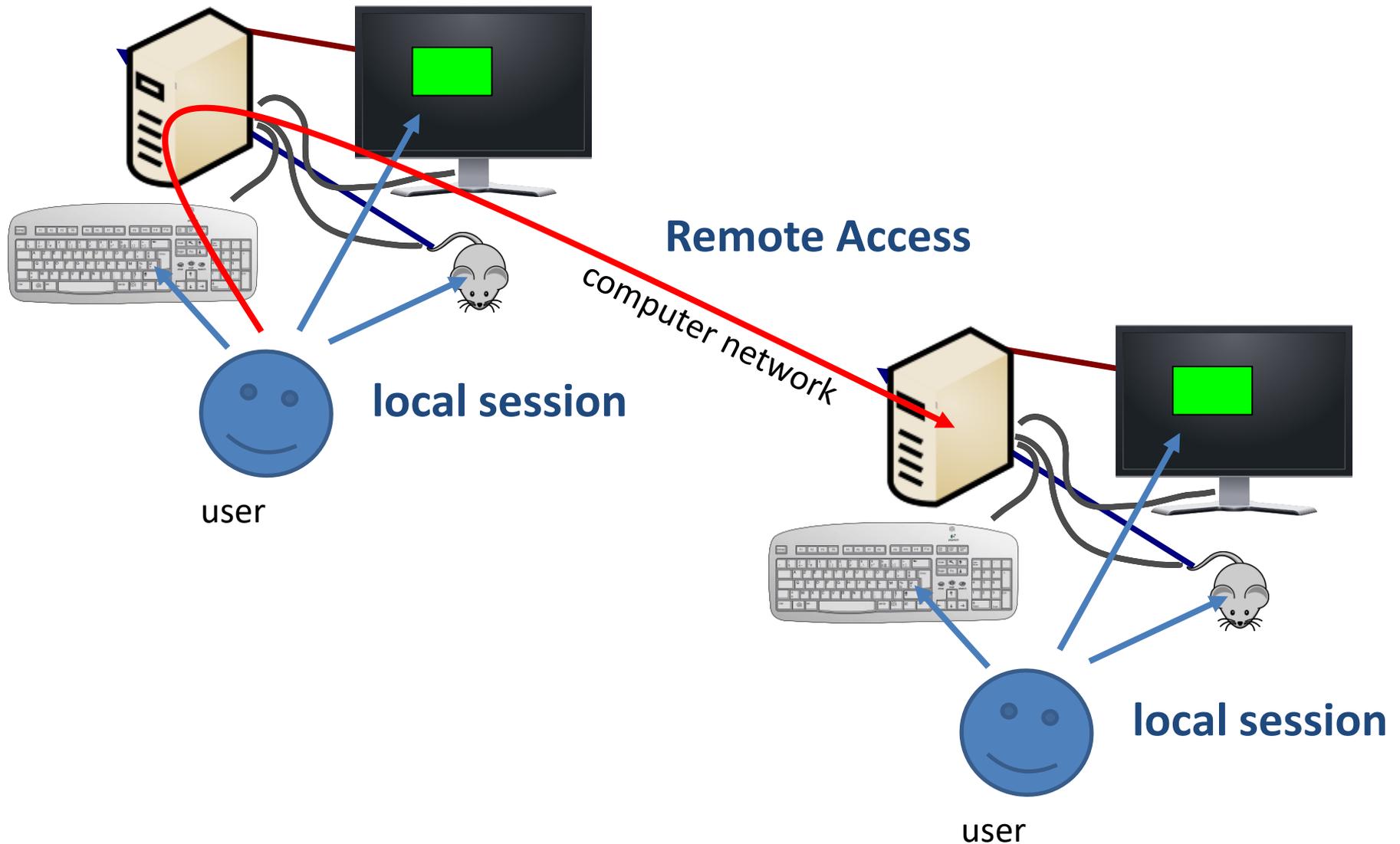
kulhanek@chemi.muni.cz

National Center for Biomolecular Research, Faculty of Science
Masaryk University, Kamenice 5, CZ-62500 Brno

First Steps

- **Local vs remote access**
- **Local login**
- **Terminals**
- **Command line**
- **Remote login, command ssh**

Local vs Remote Access



Local Login

Local terminals (historical order):

- six **text terminals** (F1 ... F6)
- one **graphical terminal** (F7, F8, ...)
- toggled using the keys **Ctrl + Alt + F1 ... Ctrl + Alt + F7**

Local terminals (new order, Ubuntu > 18.04):

- login to graphic terminal (F1)
- graphic terminals - according to use (F2, F3,...)
- text terminals - according to use (F2, F3,...)
- toggle using the keys **Ctrl + Alt + F1 ... Ctrl + Alt + F7**

Login:

- **loginname** (username) and **password** (password)
must be entered

The Linux operating system is very flexible and allows other ways of local login, such as using identification cards or cryptographic keys. More can be found in the help of PAM system (Pluggable Authentication Modules). \$ man 8 pam

Local Login

Text terminal

- makes the command line (CLI - command line interface)
- the default directory is **/home/username** (home directory)
- graphics applications (X11) can only be run with **export the display** to a remote graphics terminal
- log off command **exit**

Graphic terminal

- starts X11 server or Wayland composer and the window manager (KDE, Unity, GNOME, etc.)
- window manager (desktop environment) **can be selected before** self login
- allows direct launch of graphical programs (GUI - graphical user interface)
- the command line is available through special applications
 - xterm
 - **console**
 - **gnome-terminal**
- log out **using the menu in the menu** window manager

Local Login

Ubuntu 18.04 LTS

Login screen for graphics terminal (GUI)

Username:
kulhanek

Next

ubuntu®

Login Name (Enter)

Ability to change the type of desktop environment
(gnome, KDE, etc., some must be installed first)

Password (Enter)

Password:
●●●●●●●●

Cancel

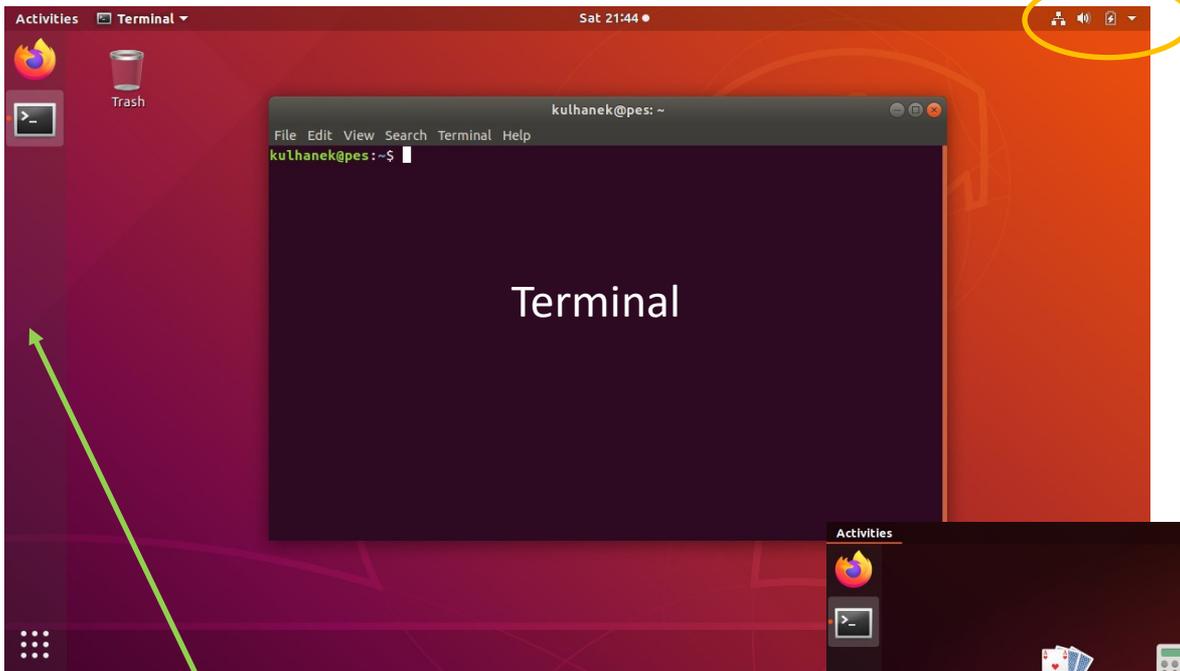
Sign In

ubuntu®

The default keyboard is English (EN).

When using the numeric keypad, make sure **NumLock** is turned on.

GNOME Desktop



Settings,
logout, shutdown

Dock
(running applications,
frequently used
applications)

Standard
applications



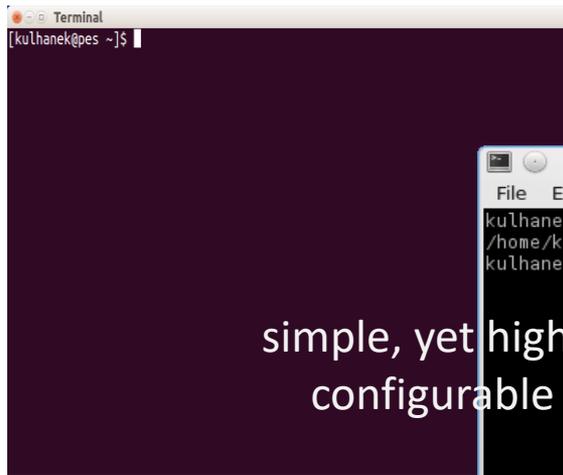
Terminals

The command line is accessible directly from text terminals. In a graphical environment (X11/Wayland), it is necessary to run a suitable application emulating a text terminal:

- **gnome-terminal (Terminal)**
- **console**
- **xterm**

The default directory is: **/home/username**

gnome-terminal



simple, yet highly
configurable

console



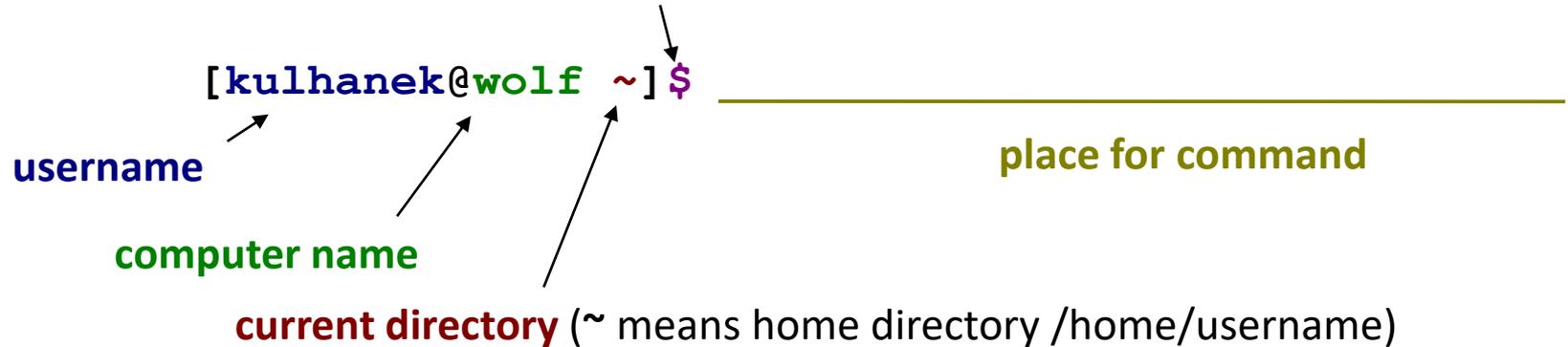
xterm



simple, standard on all
UNIX systems

Command Line

Prompt - type of user / prompt (\$ regular user, # super user, other possible %, >)



The command is executed by pressing the **Enter** key.

History: Use the up and down arrow keys to scroll through the list of commands you have already entered. The commands from the history can be reused or modified and then used in the modified form. The history is also accessible by command **history**.

Autocomplete: by pressing the Tab key (tab) the command line interpreter tries to complete the spelled word. Command names, paths and file names are added (if one press does not cause anything, there are more options to add, repeated press will display them).

Copying text: Do not use Ctrl + C! To copy text from the terminal, just highlight the text, press the mouse wheel (middle button) to paste it.

Remote Login

- ssh
- nested login

Remote Login

There are several remote login options (rsh, XDMCP, etc.) but the most used and **the safest** is the use of the **ssh** command (secure shell).

[] - can be omitted

Syntax:

```
$ ssh [user@]hostname [command]
```

username;
if not specified, the name of the
logged in user will be used

computer name

the command to be executed; if
not specified, the command line is
made available in interactive mode

Examples of use:

```
$ ssh wolf01.ncbr.muni.cz
```

```
$ ssh wolf01 who
```

Log out:

The remote interactive login (session) is terminated by the command **exit**.

Initial Remote Login

```
[kulhanek@pes ~]$ ssh skirit.ics.muni.cz
The authenticity of host 'skirit.ics.muni.cz
(2001:718:ff01:1:216:3eff:fe20:382)' can't be established.
ECDSA key fingerprint is SHA256:SpIlg9bGTNCeVSLE0E4tB30pcLS80sWuv0ezHrH1p0xE.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'skirit.ics.muni.cz' (ECDSA) to the list of known
hosts.

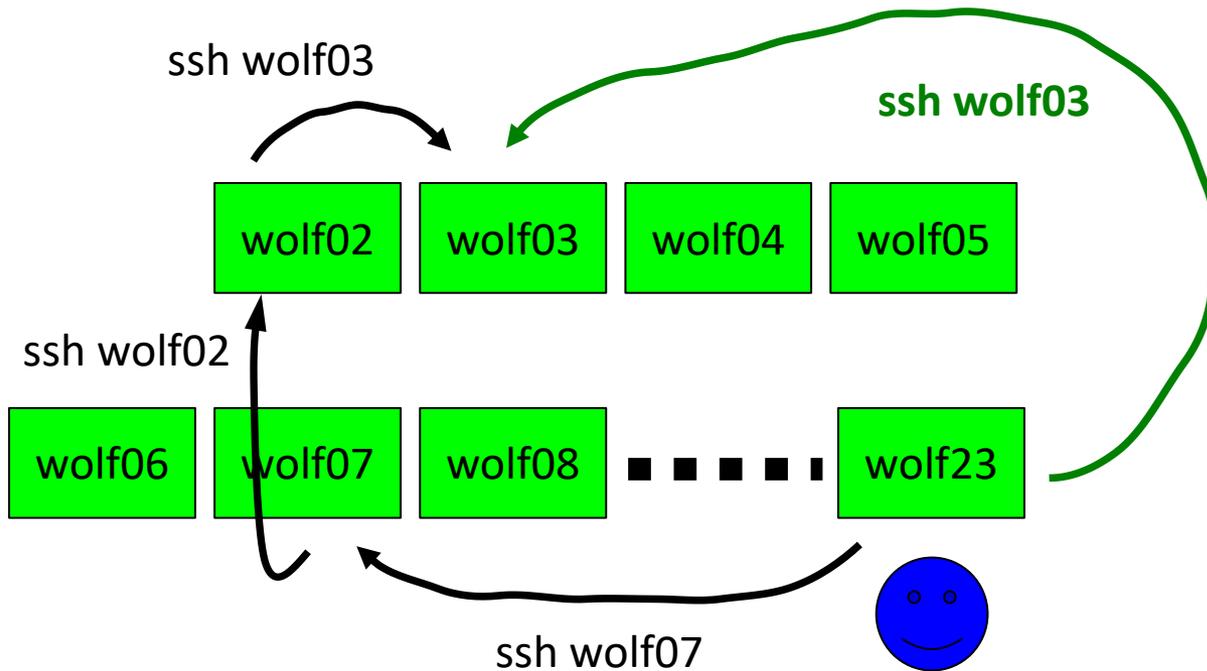
[kulhanek@skirit ~]$
```

When logging in for the first time, it is necessary to confirm the authenticity of the machine we are logging to. In a trusted network, we can accept the fingerprint without verification. However, it is a good idea to verify the machine's fingerprint in an independent way (for example, by sending a thumbprint by mail from the remote machine administrator) in an insecure environment. This is protection against MITM (Man-in-the-middle) attack.

Note:
On a WOLF cluster, all computers are verified against each other, so this confirmation is not required.

Remote Login

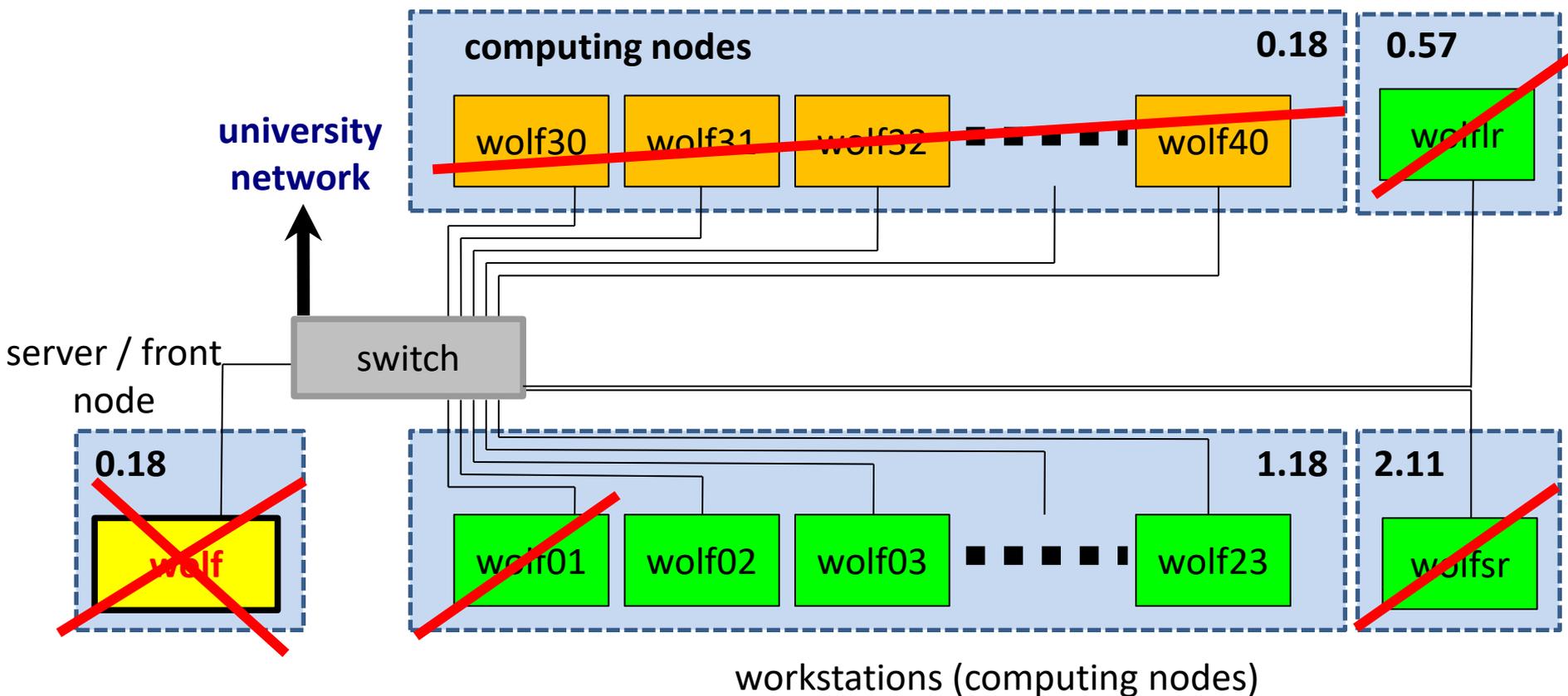
Using the command `ssh`, it is possible to do **nested remote login**.



With each new level of remote login **overhead grows**, therefore, if possible, we will use **the most direct remote login**.

Nested remote login must be used to access computers on non-public networks (e.g., supercomputers in IT4I). (details in supercomputing C2115).

WOLF Cluster - Where to login?



Full machine names:

wolf02.ncbr.muni.cz
wolf03.ncbr.muni.cz
....
wolf23.ncbr.muni.cz

Short machine names (only within the WOLF cluster):

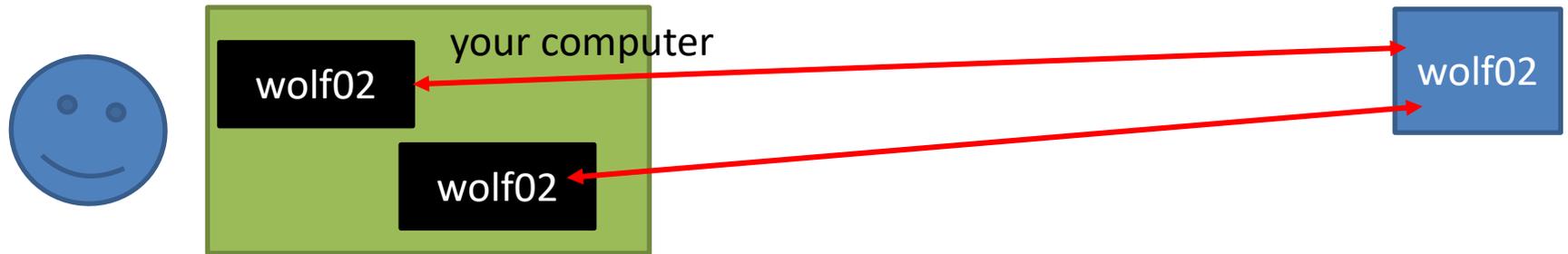
wolf02
wolf03
....
wolf23

Exercise 1

1. Remotely login onto the workstation *wolf02.ncbr.muni.cz*
 - From MS Windows (any version) use Putty (see separate presentation)
 - From Linux or macOS, use the command `ssh`
2. Verify the remote workstation name using the command: **hostname**
3. Print the full computer name using: **hostname -f**
4. Print your login name: **whoami**
5. List the logged users: **w** or **who** or **last**
6. List the contents of your home directory: **ls**
7. Print the path to your home directory: **pwd**
8. From the node *wolf02* log on to the node *wolf10* via the command **ssh**.
9. Repeat tasks 2 through 7 on node *wolf10*.
10. Log out from the *wolf10* node: **exit**
11. From the node *wolf02* run the command **hostname** remotely on the node *wolf16*.
12. From the node *wolf02* run the command **ls** remotely on the node *wolf16*.
13. Log out from the node *wolf02*: **exit**

Exercise 2

1. Open two terminal sessions on the workstation *wolf02.ncbr.muni.cz*
2. Enter commands from a previous exercise (e.g. **last**, **w**, etc.).
3. Sign out.



1. Open two terminal sessions, one on the workstation *wolf02.ncbr.muni.cz* and the other on *wolf10.ncbr.muni.cz*
2. Enter commands from a previous exercise (e.g. **last**, **w**, etc.).
3. Sign out.

